

METHODS FOR PROCESSING, OPTIMIZATION, CALIBRATION AND DISPLAY
OF MEASURED DIELECTROMETRY SIGNALS USING PROPERTY
ESTIMATION GRIDS

ABSTRACT OF THE DISCLOSURE

5 A method is disclosed for processing, optimization, calibration, and display of
measured dielectrometry signals. A property estimator is coupled by way of
instrumentation to an electrode structure and translates sensed electromagnetic
responses into estimates of one or more preselected properties or dimensions of the
material, such as dielectric permittivity and ohmic conductivity, layer thickness, or other
10 physical properties that affect dielectric properties, or presence of other lossy dielectric
or metallic objects. A dielectrometry sensor is disclosed which can be connected in
various ways to have different effective penetration depths of electric fields but with all
configurations having the same air-gap, fluid gap, or shim lift-off height, thereby greatly
improving the performance of the property estimators by decreasing the number of
15 unknowns. The sensor geometry consist of a periodic structure with, at any one time, a
single sensing element that provides for multiple wavelength within the same sensor
footprint.